AF/2881

Atty. Docket No. 002935 USA/PDC/ICT/OR
PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Dieter WINKLER et al.

Application No.: 09/162,103 Group Art Unit: 2881

Confirmation No.: 8426 Examiner: K. Fernandez

Filed: September 28, 1998

For: CHARGED PARTICLE BEAM MICROSCOPE WITH MINICOLUMN (as amended)

RESPONSE UNDER 37 C.F.R. § 1.116

BOX AF
Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Responsive to the Office Action dated June 12, 2001, the time for response having been extended by petition and payment of fee to October 12, 2001, Applicants submit the following remarks:

Claims 1-26 are all the claims pending in the subject application. Claims 1, 4 and 7-11 are rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Sturrock et al., USP 5,786,601 ("Sturrock"). Claims 2-3, 5-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sturrock, in view of Schamber, et al., USP 5,376,792 ("Schamber"). Claims 12-26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sturrock. These rejections have been made final. Applicants respectfully traverse these rejections and request reconsideration and allowance in view of the following arguments.

From Applicants' reading of the Office Action, it appears that the Examiner has focused on Applicants' approach to addressing the § 112 issues which the Examiner raised in the previous Office Action, and has concluded that the only point Applicants were trying to make overall, with respect to patentability, was that "size matters". However, as discussed in the specification of the present application, there is more to the invention than simply the concept of a minicolumn *per se*. The point is that there are things that one can do with a minicolumn, which is sized on the order of centimeters (specification, paragraph bridging pages 2 and 3) which one cannot do with a column of conventional size on the order of 15-30 inches (specification, page 1, second full paragraph).

Applicants' previous arguments have incorporated size as a feature of the present invention and to distinguish the present invention from conventional electron beam columns. The cited prior art, Sturrock and Schamber, disclose conventional electron beam columns that are completely incompatible with the present invention for reasons presented in previous responses. The fabrication and inspection of integrated circuits requires extremely high vacuums and it is critical to minimize the volume of the vacuum as well as the number of times a vacuum needs to be broken to achieve maximum production rates. Unlike a minicolumn, a conventional electron beam column adds considerable volume when attached to a vacuum chamber. For example, a conventional electron beam column may add hundreds of cubic inches in volume to be subject to a vacuum whereas a minicolumn generally will add on the order of a cubic inch – two orders of magnitude less than a conventional column.

The time necessary to achieve a suitable vacuum relates to the volume to be evacuated; the smaller the volume, the less time required. Here, size as defined by the difference between a conventional electron beam column and a minicolumn, is a measure of the vacuum volume.

Thus, size of the minicolumn is not just a matter of shrinking of parts; it is also a matter of what one can do with that smaller structure. Putting the minicolumn in its own minienvironment, as recited in claim 1, is one application which the disclosure of a column hundreds of times the volume simply cannot suggest. The fitting of a minicolumn in the main chamber (claim 7) is another. The provision of a turntable stage with a minicolumn on a holding arm (claim 12) is yet another.

Thus, notwithstanding the Examiner's citation of *Gardner v. TEC Systems*, 220 USPQ 777 (Fed. Cir. 1984), the present case is distinguishable because here, the size of a minicolumn is significant. The minicolumn's size allows it to be used in combinations in which a conventional electron beam column can not. Thus, the current invention differs from the prior art by more than just size. The current invention differs in features which are made possible by a smaller size, and these features are recited in the independent claims.

Because a minicolumn is small, an electron microscope may now have a mini-environment as recited in claim 1 and its dependencies. An electron microscope having a minicolumn may have the electron beam source contained within the vacuum chamber as recited in claim 7 and its dependencies. An electron microscope having a minicolumn may have the electron beam source mounted on an arm further allowing the use of a turnable stage as recited in claim 12 and its dependencies. An electron microscope may now have a plurality of minicolumns, as in claims 18 and 21 and their dependencies. A electron microscope also may have a plurality of minicolumns attached to a holding arm, as in claim 24 and its dependencies.

Applicants believe that a specific response to the points raised in paragraphs 13-17 is in order.

Paragraph 13: The Examiner's statement here says no more than that size is known. Applicants acknowledge this, but for the reasons set forth above, Applicants disagree that size is the key or sole criterion on which to focus for obviousness of the claimed invention. It is the overall recitation, which Applicants have discussed above, that should be considered to be the proper focus for determining whether there is a *prima facie* case of obviousness.

Paragraphs 14-16: The point of having a minienvironment, as claimed in claim 1, irrespective of whether the minienvironment is separate from or in communication with the inspection chamber is that the ability to house a minicolumn in a smaller environment than a conventional, much larger column is the reduced vacuum requirement. At the top of page 3 of the last response, Applicants acknowledged that claim 1 does not specify whether the minienvironment is separate from or in communication with the inspection chamber.

Paragraph 17: Relative to claims 2 ,3, 5, and 6, the point Applicants were trying to make here is that, assuming *arguendo* that Schamber suggested the desirability of adjustability, it did not do so in any way that related to Sturrock's teachings, nor the teachings of the present application. There are many different areas of technology in which the concept of "adjustability" in the context of reduced maintenance requirements might be desirable. However, that does not make the concept of "adjustability" readily applicable in all areas of technology, much less that of the present application. If two references are not properly combinable, then even if their combination might in some fashion yield the claimed invention, the impropriety of the combination renders the combination itself a nullity.

Looking more specifically at the Schamber and Sturrock, the lack of combinability of those references means that Schamber would not have reasonably suggested to the ordinarily skilled artisan

that Sturrock could be modified to provide the kind of adjustability contemplated in claims 2, 3, 5, and 6.

Regarding claims 12 and 24, the Examiner asserts incorrectly that the use of a rotatable stage over an x-y stage is a designer's choice consideration. When an electron beam source is fixed in relation to a vacuum chamber, a wafer can not be completely swept if a rotatable stage is used. Therefore, use of a rotatable stage is not a designer's option when using a conventional electron beam source.

Applicants previously argued that an x-y stage and a rotatable stage are not equivalent for at least two reasons. The first was that when the electron beam was fixed, as in the prior art, using an x-y stage would require twice the area of a rotatable stage thereby increasing the volume of a chamber subject to a vacuum. The second was that unlike an x-y stage, a rotatable stage could operate continuously not having the need to reverse direction thus saving acceleration and deceleration time each time a change in direction was necessary.

This last point was not an attempt to insert the requirement of "continuous scanning" into claims 12 and 24 (*see* paragraph 18 on page 3 of the Office Action). Applicants were simply making the point that a rotatable stage does not have to reverse direction, thereby facilitating continuous scanning. That there is no need to reverse direction is a direct consequence of using a turntable rather than an X-Y stage.

Applicants further argue that when an electron beam column is fixed, as in the prior art, a rotatable stage cannot be used. When in a fixed position with respect to the vacuum chamber, the electron beam is focused on a single point on the wafer and if the wafer is only rotated, all the locations

of a wafer cannot be inspected. The combination of a fixed electron beam source and a wafer on a rotatable stage cannot inspect each and every point on the surface of a wafer. The prior art teaches away from a rotatable stage because the electron columns are fixed with respect to the vacuum chamber. For this reason as well, Applicants assert claims 12, 24 and their dependencies are patentable.

Pursuant to the foregoing discussion, Applicants submit that claims 1-26 in the subject application are patentable.

The Examiner's rejections having been overcome, Applicants submit that the subject application is in condition for allowance. The Examiner is respectfully requested to contact the undersigned at the telephone number listed below to discuss other changes deemed necessary. Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

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Date: September 27, 2001

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Assistant Commissioner for Patents
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Date: September 27, 2001

Signed: Thea K. Wagner